The effect of food-price movements on African households - An investigation of food production and consumption patterns in four African countries

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Abstract

The recent spike in world food prices has intensified the debate regarding the impact of food prices on poverty. In this paper we aim to assess households' vulnerability to food-price increases in four countries in Sub-Saharan Africa. Using household data from the World Bank's Living Standard Measurement Surveys in Ghana (2005–2006), Kagera region, Tanzania (2004), Malawi (2004–2005) and South Africa (1993) we analyze food production and consumption patterns in rural and urban populations. In contrast to earlier studies we look at all food items and not just one or a few staple foods, giving a better understanding of vulnerability to general food price changes. We use two established indicators of sensitivity to food price changes—one measuring share of income spent on food, the other measuring elasticity of real income to food price changes. We find that the shares of the populations spending more than half of their income on food ranges from 62–81% in rural areas and from 26–67% in urban areas. Further we find that in all regions studied, most households (76–99%) in rural areas are net buyers of food and stand to lose in the short term from higher food prices. As expected, for urban households this is true to an even higher extent. Assessing the elasticity of real income to food price increases for the studied households we estimate that more than 25 million people in the four studied regions had their real incomes cut by more than a quarter in the 2007–2008 food price rise. Finally, we propose a new indicator, measuring the relative reduction in non-food spending needed to uphold food consumption at the same level after a food price change. We estimate that between 13–46% of the population in the four regions studied can not avoid reducing food intake and/or quality when food prices double, as they would have to decrease their non-food spending by 100% or more.

Key words: Food-prices, poverty, vulnerability indicator, Sub-Sarahan Africa, household survey

1. Introduction

There is widespread concern that increasing food prices may have a negative effect on poverty and malnutrition in developing countries. FAO recently increased their estimate of the number of food insecure people from 848 million in 2003–05 to 923 million in 2007 (FAO, 2008a, p. 6); and then again to 963 million in 2008 (FAO, 2008b), a total increase of 115 million.

Looking at *The Economist's* food-price index over the last eight years, food prices had a steep increase beginning in 2005 and continuing well into 2008. Between July 2007 and July 2008 the index increased by 55%. After that, the fall was rapid, though leveling off at prices well above those prevailing before the price hike, see Figure 1 below. The price hike was a result of many contributing factors, such as negative yield shocks in some main exporting countries (due to, mainly, adverse weather conditions), increases in energy prices, and a rapid increase in feedstock demand for biofuels (OECD-FAO, 2008).

The impact of food-price movements on poor households has also been a topic of debate in trade negotiations and dis-

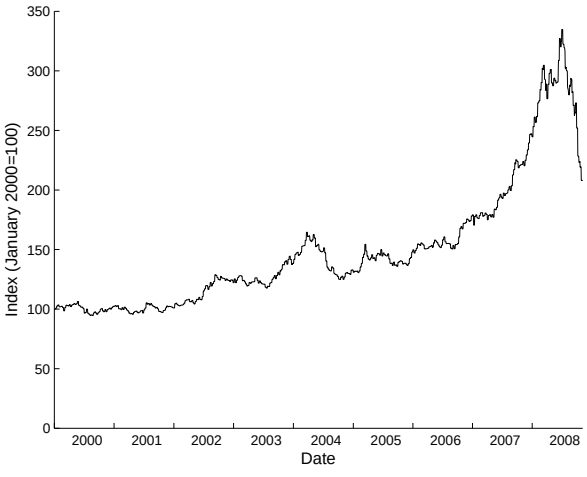

Figure 1: *The Economist's* commodity food-price index during the period January 2000 through October 2008 (Source: *Thomson Financial*, 2008).

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cussions about the pros and cons of food aid (Levinsohn and McMillan, 2005). One concern has been that, by increasing the supply of food, food aid may reduce domestic food prices and thereby local farmers' income.

In the trade liberalization debate the focus has been on subsidies to farmers in rich countries, and that these subsidies drive down global food prices. Most poor countries are net importers and will stand to gain from lower prices. A debate has nevertheless arisen about the consequences of removing or reducing agricultural subsidies, particularly rich countries' export subsidies (see, e.g., Panagariya, 2005; Stiglitz and Charlton, 2005), where some claim that depressed prices will keep poor farmers in the developing world poor since it reduces incentives to develop agriculture.

The rising number of food insecure, the ongoing debate on trade and agricultural subsidies, and the recent large movements in prices, all call for thorough studies of the impact of price fluctuations on, *inter alia*, food security, poverty and hunger. The impact of higher food prices on people's welfare can be expected to be larger in developing countries than in the richer countries, since in the former food constitutes a larger part of the consumption basket. As an example, food accounts for 62% and 65% of the consumer price index (CPI) in Sri Lanka and Bangladesh, respectively (OECD-FAO, 2008, p. 36). This can be compared to the USA and Sweden where the corresponding figures are 10% and 13%, respectively (OECD-FAO, 2008, p. 36).

However, these aggregates hide the fact that households differ a lot in consumption and production patterns. Poverty and malnutrition occur at the household level and higher food prices may significantly reduce welfare for the proportion of the population who are poor net buyers.

As expected, urban poor have much to lose from higher food prices since they produce little food and live close to or below the poverty line. Rural populations, perhaps more surprisingly, are also mainly net buyers of food, since surpluses from rural areas are mainly produced by a few commercial smallholders (World Bank, 2008b, p. 5).

The aim of this paper is to look at the effects of changing food-prices on households in four sub-Saharan African countries (Ghana, Malawi, South Africa, and Tanzania) in order to estimate how large shares of the populations that would benefit from rising prices and how large shares would stand to lose. The analysis is based on household surveys from the four countries and is focused on discussing and developing appropriate indicators for vulnerability to food-price changes. We investigate by how much different segments of the populations are affected and not only if they are net buyers or net sellers of food. In contrast to many earlier studies we also include all produced and consumed food items in our measures and not only one or a few crops. We look at the first order impact (static effects) and disregard from dynamic responses to the higher food prices (e.g., efforts to increase yields and changes in agricultural wages).

The rest of the paper is structured as follows. In the next section a review of earlier studies is presented. Section 3 covers the methodology and the statistical data sets used to study the households, with emphasis on elucidating and evaluating existing indicators of vulnerability to food-price changes, as well as to propose refinements of these. In Section 4 the results are presented. In Section 5 we discuss the results and draw some final conclusions.

2. A brief review of earlier studies

Among the first to point out that a large share of the population in many developing countries are not net sellers of food, and hence may lose from higher food prices, were Weber et al. (1988). Compiling results from studies of five countries in Sub-Saharan Africa they showed that the share of net buyers ranged from 15% to 73% (see Table 1), though sample sizes were small and only one or two crops was considered in each study.

Later studies have shown similar results, as is displayed in Table 1. Barrett and Dorosh (1996, p. 667) found that rice farmers in Madagascar who fell below the poverty line—roughly one third of all rice farmers—were net purchasers of rice. Similarly, Sahn (1998) found that 84% of rural households in Sri Lanka are net buyers of rice and Ivanic and Martin (2008) showed that the income of the poor would decrease considerably with higher rice prices in Madagascar. Minot and Goletti (1998) studied the effect of changing rice prices in Vietnam. According to their analysis, less than one-third of Vietnamese households are net sellers of rice and would benefit from higher prices.

Levinsohn and McMillan (2005) studied households in Ethiopia and wheat prices. The household data showed that, at all income levels, more households were net buyers than net sellers of wheat. Roughly 85% of the poorest households were net buyers. Just as Barrett and Dorosh (1996) and Ivanic and Martin (2008) they showed that a reduction in price of the main staple would benefit poor households more than wealthier households.

Zezza et al. (2008) studied 11 developing countries from four continents, looking at the three main tradable staples for each country and a 10% price increase for these. They found that 18% of all households and 25% of rural households are net sellers of these main staples, but they point towards heterogeneity and that a large share (although still a minority) of the rural households actually benefit from rising food prices. In contrast to Minot and Goletti (1998), Zezza et al. found that the rural population in Vietnam would on average benefit from an increase in rice prices.

FAO (2008c) used the *Rural Income Generating Activities* (RIGA) dataset (FAO and World Bank, 2008) to identify the proportion of net food sellers of the main food staple in seven countries. Data from five more countries were also collected from Aksoy and Isik-Dikmelik (2008), which were based on two to three staples per country. Taking an unweighted mean across the twelve countries only 31% of rural, 7% of urban, and 23% of the whole populations were net sellers of the studied food crops.

Deaton (1989a,b)—studying the effects of changes in rice prices on the income distribution in Thailand—introduced the

concept net benefit ratio (NBR). The NBR for a certain commodity and household is defined as the net sales of the commodity divided by the household's expenditures including consumption of own-produced food, that is,

$$NBR_i = \frac{p_i(y_i - q_i)}{x}, \quad (1)$$

where p_i is the price of good i, y_i and q_i denote the production and consumption, respectively, of good i by the household, and x is the household's expenditures, including both monetary expenditures for purchased goods, consumption of food items produced on their own farm, or food items obtained as salary for work on other farms. Expenditures are more evenly distributed over the year, than income, and are therefore used as a good approximation of longer-term economic turnover (Deaton, 1997, p. 148).

The NBR is a measure of the first-order impact on the household's welfare following a movement in the price of a certain good. The normalization by household expenditures is done to express the relative gain or loss in the household's total budget. For example, if the price of the studied good increases by 1%, a household with an NBR of −0.5 would see its real income drop by (approximately) 0.5%. The NBR can therefore be interpreted as elasticity of real income with respect to price movements in the good (Budd, 1993, p. 589).

Referring to rural households in Thailand, Deaton concluded that higher rice prices would benefit the *average* rural household at all levels of living (Deaton, 1989b, p. 23). The ones that would benefit the most were in the middle of the income distribution. Deaton attributed the last result to the fact that, although rich rice farmers sell much of their produce, few rich households grow rice at all. Many of the poorest households do grow rice, but can only sell a little on the market and often even have to buy rice in addition to their own production (Deaton, 1997, p. 196).

In line with Deaton's approach, FAO (2008c) used compensating variation (CV) as a measure of the economic impact of price-increases. The CV describes the monetary transfer needed to restore a household to the welfare level it had before the price change occurred.

The CV was calculated for seven countries from the RIGA dataset for rural and urban households divided into per capita expenditure quintiles. The main results from the analysis are that urban consumers lose most from increased prices, and that the poorest quintiles are affected the most.

In summary, much of the research on net food buyers has focused on single crops or only a few crops. One reason for this is that many studies have dealt with specific trade policies, which will affect the prices of certain crops. Another reason is that perhaps not all prices will move in unison. However, we propose that the focus on few crops causes some problems. If households specialize in one or a few crops, being the main staples in the country studied, but buy a wider variety of crops and processed food, an analysis that only accounts for production and consumption of the main staples will make the household look less vulnerable to rising food prices than they in fact are. If food-price movements are general (which often is the case, cf. FAO, 2008, p. 35), it is therefore more revealing to study the households' positions as total net food sellers or buyers. This is the approach taken in this paper.

3. Method

In this section we present the methodology we used for assessing households' vulnerability to food-price changes. First, we present the household data sets used in our analysis and how these data have been prepared. Second, we present and discuss established indicators of vulnerability to food-price changes and based on this propose a new indicator that we argue add important perspectives on, and in some cases more accurately captures, the heterogeneity in households' vulnerability to food-price-increases.

3.1. Household data

This study was conducted using data from the World Bank Living Standards Measurement Study (LSMS) in four regions: Ghana, Kagera (a region in northwest Tanzania), Malawi and South Africa. Three of the four countries in this study—Ghana, Malawi and Tanzania—are listed as Low-Income Food-Deficit Countries (LIFDC), by the UN's Food and Agriculture Organization (FAO), as are the majority of countries in Sub-Saharan Africa. The household data were collected by the national statistical offices in the countries in collaboration with the World Bank (World Bank, 2008a). Table 2 gives an overview of the studies.

Household studies are very expensive and work-demanding to perform (Deaton, 1997). Therefore they tend to be conducted at irregular intervals and at different times in different countries. Consequently, not all studies used here were conducted in the same time-period. Although the studies have been conducted in somewhat different ways, they all thoroughly investigate the living conditions of a statistically significant sample of a certain population. An important aspect of the living standard is the access to, and consumption of, food, which was investigated in an exhaustive manner in all the LSMS studies used. All interviewed families and individuals were asked what they eat, produce, sell, purchase, receive, give away and consume of virtually every possible crop, feed, food, meat and refined food product.

In the LSMS the individual household members are considered as independent persons in some questions and as a part of an aggregate unit of the household in other questions. Such differences are rational since few families keep an account of what separate members consume and contribute to in the household. In this study the families have been viewed as aggregates where their whole consumption patterns have been considered. This has been done even though there often are intra-family inequalities, but due to a lack of data there has been no possibility to

Table 1: Summary of selected studies on net food buyers.

Author(s)	Country	Year(s)	Crop(s)	Share of net buyers		
				Urban	Rural	Total
Sahn (1998)	Sri Lanka	1980–81	Rice		84 %	
Weber et al. (1988)	Mali	1985–86	Coarse grain			39 %
	Rwanda	1986–87	Beans			73 %
			Sorghum			67 %
	Senegal	1986–87	Coarse grain			30 %
	Somalia	1986–97	Maize			61 %
	Zimbabwe	1984–85	Maize	15–25 %		
Minot and Goletti (1998)	Vietnam	1992–93	Rice	95 %	52 %	60 %
Levinsohn and McMillan (2005)	Ethiopia (poorest households)	1999–2000	Wheat			85 %
Aksoy and Isik-Dikmelik (2008)	Bangladesh	2000	Rice	96%	77%	81%
	Bolivia	2002	Rice, Maize	99%	75%	90%
	Cambodia	1999	Rice, Maize	85%	56%	60%
	Ethiopia	2000	Wheat, Maize	94%	73%	77%
	Madagascar	2001	Rice, Maize	87%	62%	68%
	Nicaragua	2001	Bean, Maize	96%	61%	83%
	Peru	2003	Rice, Maize, Beans	97%	85%	93%
	Vietnam	1998	Rice, Maize	93%	52%	62%
	Zambia	1998	Rice, Maize, Groundnut, Beans	97%	70%	81%
FAO (2008c)	Bangladesh	2000	*Main staple as defined in RIGA (2008)*	97%	81%	84%
	Ghana	1998		86%	57%	67%
	Guatemala	2000		97%	85%	90%
	Madagascar	1993		86%	41%	49%
	Malawi	2004		92%	88%	88%
	Pakistan	2001		97%	73%	80%
	Vietnam	1998		93%	49%	60%
Zezza et al. (2008)	Albania	2005	Maize, Rice, Wheat	99%	68%	83%
	Bangladesh	2000	Rice, Wheat, Pulses	96%	72%	77%
	Ghana	1998	Maize, Rice	92%	72%	79%
	Guatemala	2000	Maize, Beans, Wheat	98%	86%	91%
	Malawi	2004	Maize, Rice, Pulses	97%	93%	93%
	Nepal	2003	Maize, Rice, Wheat	89%	65%	69%
	Nicaragua	2001	Maize, Rice, Beans	98%	79%	90%
	Pakistan	2001	Wheat, Rice, Beans, Maize	98%	79%	84%
	Panama	2003	Wheat, Maize, Rice	100%	90%	96%
	Tajikistan	2003	Rice, Beans, Wheat	100%	89%	93%
	Vietnam	1998	Rice, Maize, Beans	91%	32%	46%

take this into consideration. There is also reason to believe that a change in the wealth of a family changes the wealth for the separate individuals in the same direction, although unevenly. The household data were later multiplied by household size so comparisons could be made on an individual basis, even though every member of a household was considered to be an average family member.

In the LSMS, each family has been interviewed about aspects of their daily lives that have to do with production, consumption, working, spending, receiving/giving gifts, etc.. Different aspects have been inquired for different recall periods and the recall periods differ slightly between the studies, some for the last year and some for the last 7–14 days. In all studies, a large share of the questions used a recall period of one year. In this study we have converted all time spans to one (1) year, by multiplying with an appropriate conversion factor where feasible or by calculating with seasons or frequencies where such information was available. Seasonal variations were inquired mainly for agriculturally related items for production, sales and consumption in the surveys.

There are difficulties related to recall periods and seasonal variations in the sense that people forget what they spend and earn. There may also be important variations. For instance a family may have purchased something very expensive recently prior to the interview or they might have had an unusually bad harvest the year the study was conducted. Situations such as these alter the results, but there were no possibilities to correct for these caveats in this study.

3.2. Classification of household expenditures

In order to calculate indices that evaluate households vulnerability to changing food prices, each household's economy was divided into four broad categories; *sold food, purchased food, auto-consumed food* and *non-food expenditures*. Based

Table 2: LSMS survey information. Sample size numbers refer to the number of households used in our study after deduction of outliers. Numbers within brackets are the actual numbers of interviewed households.

		Sample size		
Study	Population (share rural)	Sample	Urban	Rural
Ghana (2005–2006)	23 million (63%)	8635 (8687)	3587	5048
Kagera region (Tanzania, 2004)	1.9 million (94%)	2707 (2774)	440	2267
Malawi (2004–2005)	13 million (88%)	11280 (11280)	1440	9840
South Africa (1993)	42 million (55%)	8594 (8803)	4427	4167

on these classifications we can also calculate *total expenditures*, being the sum of *purchased food*, *auto-consumed food*.

Sold food includes all items of food and feed that are grown, produced or refined within the household and sold at any kind of market. If a payment was not done through monetary means, a monetary price was estimated. This was done directly by the interviewee, or if he/she did not provide an estimate, we assigned a mean price for the good in question.

Purchased food is food that is purchased on any kind of market. Refinement and retailing of food or goods at any business-scale was included in the surveys and is considered.

Auto-consumed food refers to food that households produce and consume in-house and thus never reaches the market. It also contains food that is given to the family in any way, such as through aid, salaries or gifts. Auto consumption is important for subsistence farmers since it often makes up a large part of their total income. A market price has been assigned to all auto-consumed food and the resulting value has been added to *total expenditures*.

Non-food expenditures consists of spending on education, transport, given gifts, feed cost, farm costs, energy costs, etc. Included in the non-food expenditures is also a depreciation of household durable goods, such as tools, machinery and utensils. For South Africa, Kagera and Ghana the depreciation rate was chosen as 20% annually. The value of 20% was taken from the Statistical Office in Ghana for the GLSS 5 study, where it was arbitrarily estimated in lack of more accurate information (Coulombe and McKay, 2008). In the Malawian study the depreciation cost was provided in the auxiliary data sheets to the study and calculated using an estimated lifetime based on the respondents' apprehension of the remaining lifetime of each item.

3.3. Indicators of vulnerability to food-price changes

In this section we will present the three indicators we use to study the households' exposure to food-price movements. All three are dimensionless numbers that can be compared between countries, regions and households.

To facilitate the understanding of the indicators we use a generalized household budget, illustrated in Table 3 below. In the table, income and expenditures have been divided into their food, auto consumption, and non-food components, in accordance with the classification of the household data presented above. Auto consumption is stated both as an income, b, and as an expenditure, e, in the table and, naturally, they are valued the same, i.e., $e = b$.

Table 3: Simplified household budget, displaying income and expenditures.

	Income	Expenditures
Food	a	d
Auto consumption	b	e
Non-food	c	f

The first indicator, *Food Over Expenditures* (FOE), is each household's food consumption divided by its total expenditures. It depicts the share of the household budget that is spent on food, i.e.,

$$FOE = \frac{d+e}{d+e+f} = \\ = \frac{auto\text{-}consumed\ food + purchased\ food}{total\ expenditures}. \quad (2)$$

Total expenditures, as mentioned, include auto consumption, i.e., food and goods produced and consumed within the households. As discussed earlier, expenditures are used as a proxy for income since they are easier to measure and tend to be more evenly distributed over the year, than income is (Deaton, 1997, pp. 148–149).

In general, the higher the FOE, the poorer the household is. If the value of the indicator is unity, to take an extreme case, and part of the income stems from other sources than food production, then the only response to higher food prices is a reduction in food consumption or a shift towards less costly food items (under the assumption that other sources of finance that can compensate for the higher food prices are not available).

However, a high value for the indicator does not necessarily mean that the household will lose from higher food prices. For instance, if a household spends 90% of its income on food but derives 100% of its income from farm activities, then higher food prices could still mean that they would become better off.

In order to more accurately estimate short-term impacts from a certain change in food prices for a household we therefore also calculated the *Net Benefit Ratio* (NBR) for our data set, following Deaton (1989b; 1997). However, we deviate from Deaton in that we aggregated over all food items (instead of calculating the index for just one food item). We also deviate from Deaton in that we allowed differing prices for purchased and sold goods. The NBR as estimated here is expressed as

$$\begin{aligned} NBR &= \sum_i NBR_i = \sum_i \frac{p_i^s \cdot y_i - p_i^p \cdot q_i}{x} \\ &= \frac{a-d}{d+e+f} = \frac{sold\ food - purchased\ food}{total\ expenditures}, \end{aligned} \tag{3}$$

where p_i^s is the price for sold food item *i* and p_i^p is the price for purchased food item *i*.

If a household does not receive any income from selling or producing food, and purchased food makes up all its expenditures, its NBR equals -1, which is the lowest possible value and means that higher food prices result in less food consumption, a shift towards less expensive food, or both (unless other financial sources, such as savings, could be made available). A farmer who produces more food than he/she consumes, has a positive NBR, meaning that rising food prices would bring economic benefits.

As described above in Section 2, the NBR can be interpreted as the elasticity of real income with respect to the price movement, i.e., how much a household's real income would change from a percentage change in food prices (*ceteris paribus*). However, two households might have the same NBR but still be affected differently by price movements. Consider the following hypothetical example of two households, a rural poor and an urban poor, with budgets laid out in Table 4 in the same way as in the generic example above. These household budgets are of course only illustrative examples and the differences between the households are deliberately made large to clearly illustrate how the indicators should be apprehended.

As can be seen in the left-hand side of Table 4, both households, consume the same amount food (in monetary terms), though for the rural household two-thirds is produced in-house. The urban household, on the other hand, derives all its income from non-agricultural activities and has a higher non-food budget share.

The right-hand side of Table 4 displays how the households would be affected by a 10% increase in food prices, under the assumption that the households continue to produce and consume the same food baskets as before the price movement. The latter is of course a simplification (in reality the households would adjust both food and non-food spending to the new prices) but serves to illustrate here how the households would be hit by higher food prices.

Although both households display the same NBR (-0.3), in one sense the rural household appears more vulnerable to food-price movements, since it "has to" cut back on its non-food expenditures by 30%. It is even possible that it cannot decrease its non-food expenditures by this amount if it is already close to subsistence level. The household would then have to cut back on food spending instead. The urban household, on the other hand, only "has to" cut back on non-food expenditures by approximately 4.3% (from 210 to 201), which would be more bearable. This intuition is reflected in the fact that the rural household spends more of its budget on food and consequently displays a higher FOE value ($FOE_{rural} = 0.6$, while $FOE_{urban} = 0.3$).

This calls for an indicator that combines the aspects of the FOE and NBR indicators, capturing both the share of each household's budget spent on food and whether the household is a net buyer or net seller of food.

Here we propose a third indicator that measures a household's vulnerability to food-price changes expressed as its relative non-food-spending response to a food-price change, assuming an unaltered food basket. We can express the *Non-Food Compensation* (NFC) ratio to food prices, so that we have

$$NFC = \frac{a-d}{f} = \frac{sold\ food - purchased\ food}{non\text{-}food\ expenditures}. \tag{4}$$

Our hypothetical urban household displays an NFC of -0.43, being a net buyer of food, and would have to reduce its non-food expenditures by 4.3% if food prices increase by 10% (in order to continue consuming the same food basket as before the price increase). The corresponding figure for the rural household is an NFC of -3, giving a non-food reduction of 30%, which illustrates that the latter household is more sensitive to food-price-increases.

Finally, note that this indicator is in fact a combination of the FOE and NBR indicators and can be written
$NFC = NBR/(1 - FOE)$.

4. Results

Here the calculated indicators are presented in graphs displaying cumulative distribution, with population on the x-axis and indicator on the y-axis. In each graph the households are ordered, starting with households with the lowest values for the respective indicator to the left and gradually increasing numbers towards the right. Numbers have been calculated per household, but weighted with each household size to get a distribution representative for the total population in each region.

In Figure 2 (FOE), it can be seen that the studied populations spend large parts of their budgets on food. Of the total populations in the studied regions, the share spending more than half of their income on food ranges between 46% and 77%. In rural areas 81%, 77%, 79% and 62% of the populations spend more than half their budgets on food in Ghana, Kagera, Malawi and South Africa, respectively. In urban areas the FOE values are lower, especially in South Africa: 67%, 51%, 64% and 26% of urban populations spend more than half their budgets on food in Ghana, Kagera, Malawi and South Africa, respectively.

Table 4: An example of a hypothetical comparison between a poor rural and a poor urban household's income and expenditures before and after a 10% increase in food prices. The after-food-price-change numbers assume an unaltered food basket and the non-food expenditures change compensate for the increasing prices.

		Before food-price change		After food-price change	
		Income	Expenditures	Income	Expenditures
Rural poor	Food	0	30	0	33
	Auto consumption	60	60	66	66
	Non-food	40	10	40	7
Urban poor	Food	0	90	0	99
	Auto consumption	0	0	0	0
	Non-food	300	210	300	201

Figure 3 depicts NBR for the four regions, divided into rural, urban and total populations. The net-buyer share of the population is high in all regions, ranging from 83% in Ghana to 99% in South Africa. This is in line with earlier studies for individual crops, as discussed in Section 2 and presented in Table 1. Net buyers of food dominate the rural areas in all regions studied: 76%, 87%, 90% and 99% of the rural populations are net food buyers in Ghana, Kagera, Malawi and South Africa, respectively. Urban populations are, as expected, net buyers of food to an even larger extent: 95%, 99%, 99% and 99% in Ghana, Kagera, Malawi and South Africa, respectively.

The share of net buyers presented here for Ghana and Malawi are in almost all cases higher than the numbers given for the same countries in studies published by FAO (2008c) and by Zezza et al. (2008). A likely explanation for the difference is that we include all food items whereas FAO and Zezza et al. analyze only the main staple(s) and that more households are net sellers of the main staple(s) than of other food items. This illustrates an advantage of using aggregate food income and expenditure data for assessing poor countries' vulnerability to general food-price hikes.

As can be seen in Figure 3, in all regions but South Africa, urban populations are more vulnerable to an increase in food prices (as measured by the indicator NBR) than rural populations, although rural populations spend larger shares of their incomes on food, according to Figure 2. The lower value for urban populations stems from them being more dependent on purchased food than rural populations. While their incomes are typically higher—reducing the magnitude of this indicator—they are not high enough to compensate for their larger net purchases, making them more sensitive to rising food prices than rural populations.

The one exception to this rule is the rural population in South Africa, which is found to be more sensitive to increasing food prices than the urban. This can be explained by food production being highly concentrated to a few actors in rural South Africa and that urban incomes are so high that the NBR drops to levels lower than those for the rural areas.

The secondary axis in the graphs in Figure 3 displays the loss in real income resulting from a 100% increase in food prices, in line with the price hike experienced in the period 2007–2008. For example, one can see that just over 60% of the urban population in Ghana would see its real income drop by more than 25% if food prices doubled. For the rural areas 25% would experience the same welfare loss. In absolute numbers, based on the data presented here, we estimate that approximately 25 million people in the four regions studied saw their real income decrease by more than a quarter in the 2007–2008 food price spike.

Looking at Figure 4, the results for NFC display a similar pattern as those for NBR. The nominator (i.e., the household's position as net food buyer or seller) is the same in the two indicators, so the share of the population estimated to be negatively affected by a food-price increase has not changed. What can be seen is that most households would have to drastically decrease their consumption of non-food items in order to continue consuming the same food basket after an increase in food prices. 46%, 13%, 21% and 42% of the populations of the populations in Ghana, Kagera, Malawi and South Africa, respectively, can not avoid reducing food intake and/or quality if food prices doubled, as it would mean that they would have to decrease their non-food spending by 100% or more. Again, in absolute numbers this translates to a total of 31 million people in the four studied regions that would be unable to uphold food intake/quality if food prices double.

Of course, this is an underestimate of the true number of people that would have to reduce food intake due to a food price increase of 100%. For instance, in all cases where non-food spending is constituted of depreciation of durable goods (shovels, etc.), decreasing this spending would of course be impossible. Also, in reality, all consumers reduce consumption, *ceteris paribus*, of a good in response to a price increase.

Even though there are large similarities between the NBR and NFC graphs there are a couple of noticeable differences. Firstly, while NBR displays a similar pattern for all four regions—no region sticking out as notably more vulnerable—for NFC, Ghana and rural South Africa stand out. With a high share of the population in Ghana spending most of their income on food (i.e., FOE above 70–80%), the share of people in Ghana being very vulnerable to food price increases is larger than in the other countries studied. For rural South Africa the main explanation is a combination of relatively high FOE and large negative NBR

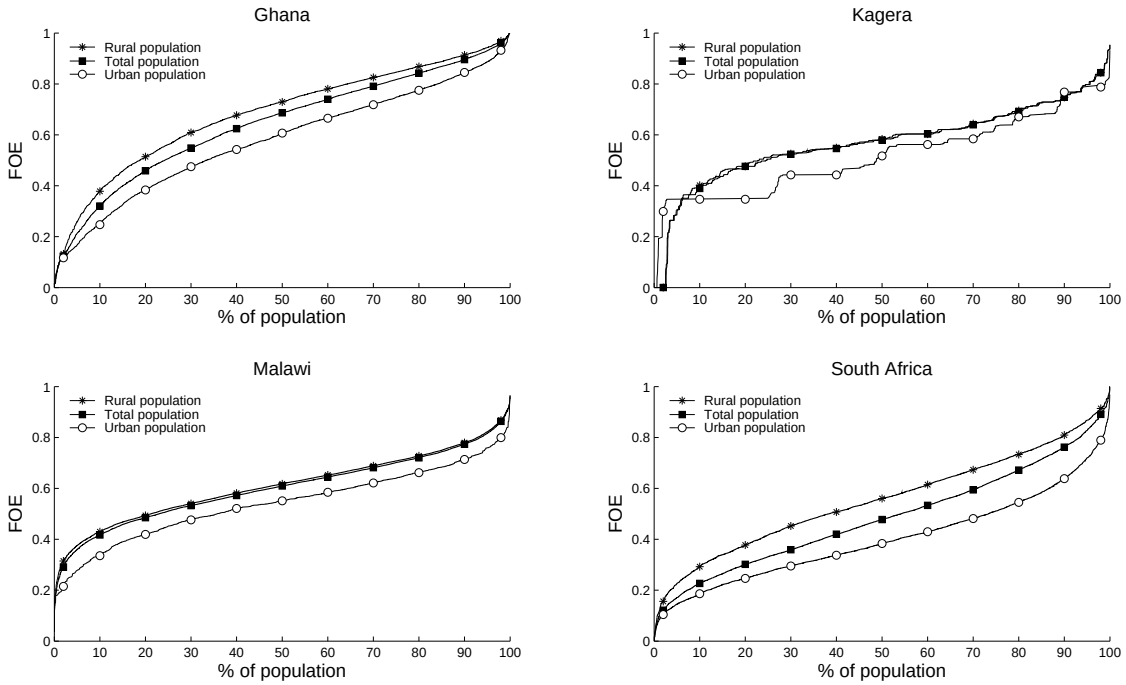

Figure 2: Fraction of household budget spent on food (FOE). 76%, 75%, 77% and 46% spend more than half their budgets on food in Ghana, Kagera, Malawi and South Africa, respectively. These estimates for the total populations closely follow the curves for the rural populations in Malawi and Kagera since 88% and 94%, respectively, live in rural areas in these regions. There was a large variation in size of statistical weights for households in the Kagera region. This results in the irregular shape of the curve for the urban population in Kagera, with some households, which were assigned large weights, represented by long straight lines.

values.

Secondly, combining FOE and NBR measures of sensitivity to food-price increases implies that differences between rural and urban populations are moderated. That is, while FOE shows that rural populations spend larger shares of their income on food—making them more vulnerable to price increases in this commodity—NBR values suggest that they are less vulnerable due to lower reliance on purchased food. For NFC these effects partly cancel each other out, bringing the indicator values for rural and urban populations closer together (especially evident for the Kagera region). Again, however, South Africa is an exception, as the rural population was estimated to be more sensitive to food-price rises, both as measured by FOE and NBR. For South Africa NFC thus displays an even larger difference between urban and rural populations, with the latter coming out as much more vulnerable to food-price hikes.

5. Discussion and conclusions

In this paper we have tried to assess households' vulnerability to food-price changes in four African regions. Our analysis differs from earlier studies in two main respects. Firstly, we chose to aggregate all food items in our analysis. Secondly we use three different indicators to better capture the multi dimensionality of food-price vulnerability.

While studies focusing on main staple(s) in a country more clearly indicate what first-order impacts of a price movement in that (those) crop(s) would be, our measures, which include all food items (crops, fish, meat, dairy products), indicate how vulnerable the populations are to general food-price movements. This is of interest since different food prices are linked by trade on markets, by opportunity costs for production on scarce land, and by labor limitations, as was evident in the 2007–2008 world food-price spike.

However, the implicit assumption that all food prices move in unison may still be a limitation. For example, FAO (2008c) argue that aggregate effects of rising food prices on households that are both producers and consumers of different commodities depend on relative price changes between different commodities (FAO, 2008c, p. 31). To get an even more accurate picture of how poor households' were affected by the recent food-price changes, one should do a more disaggregated analysis, accounting for individual price changes and production and consumption patterns for different commodity groups, before aggregating to an overall effect on the households economy.

Vulnerability to food-price changes is a complex issue with many facets that are not easily collapsed into a single number. Therefore we use three indicators to view multidimensional poverty-food-production nexus from different perspectives. The first two indicators are well-established in the liter-

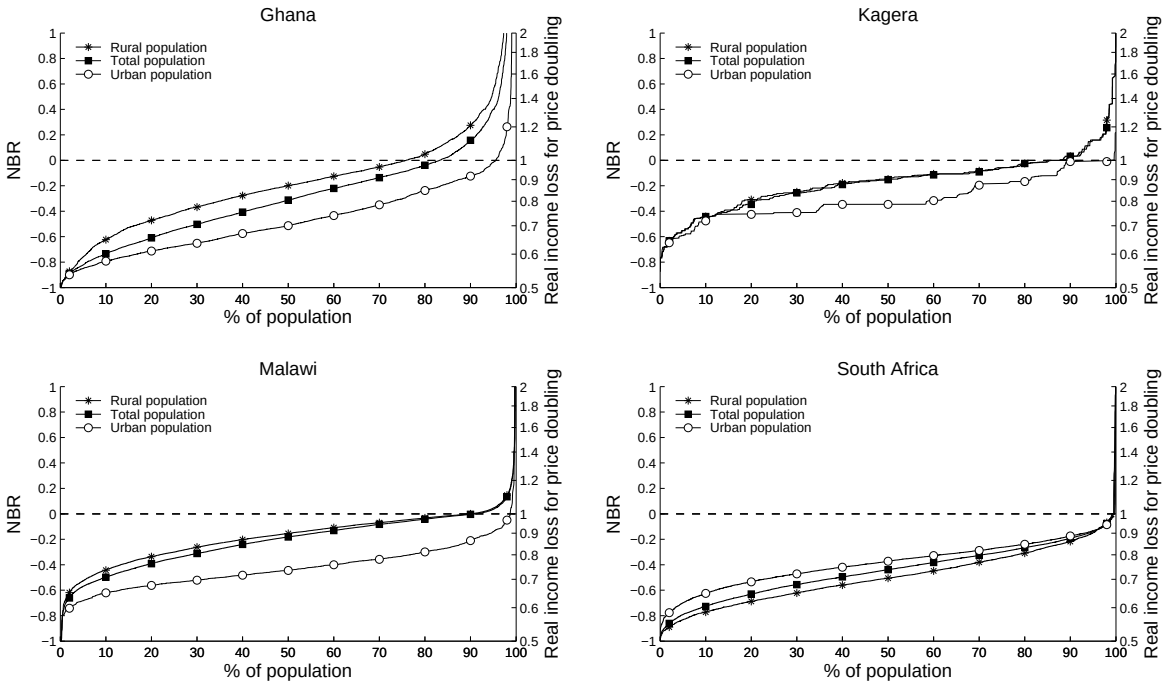

Figure 3: Net Benefit Ratio (NBR), measuring the elasticity of real income with respect to food-price changes. Of all households, 83%, 88%, 91% and 99% are net buyers of food in Ghana, Kagera, Malawi and South Africa, respectively. The secondary axes display the change in real income resulting from a doubling of food prices.

ature and focus on two factors affecting households' vulnerability to food price changes: poverty (FOE) and position as net seller or buyer (NBR). The third indicator is a combination of these two, capturing how the impact from a relative loss in income depends on a household's absolute income and thus its ability to compensate for this loss.

Finally, we have shown that higher food prices are expected to lead to significant welfare losses for both urban and rural populations in all four studied countries *in the near term.* A more complex question is how sustained high food prices may affect poverty levels in the longer term. Higher food prices may lead to higher salaries for rural workers. More importantly, it may also provide incentives to increase agricultural productivity. If that happens, many farmers may become net-producers of food.

However, higher food prices alone may not be sufficient. In order to achieve higher productivity, more inputs into the agricultural system will likely be needed, for instance more fertilizers. If most farmers lose income from higher food prices, they will be even less likely to afford to increase fertilizer use. For this reason, improved access to credit and international aid to agriculture are needed.

6. Acknowledgements

The authors greatly acknowledge the Swedish Energy Agency and Carl Bennet AB, for financial support; and the statistical offices in Ghana, Malawi, South Africa and Tanzania, for sharing the information from their living-standard measurement surveys. A special thank you to Jacqueline Anum (statistical office in Ghana) and Diane Steele (World Bank) for providing help and extra information regarding the surveys. We would also like to thank Winnie Bell for proofreading and providing valuable linguistic comments. The opinions expressed in the article are solely those of the authors.

Notes

[1]These household budgets are of course only illustrative examples and the differences between the households are deliberately made large to clearly illustrate how the indicators should be apprehended.

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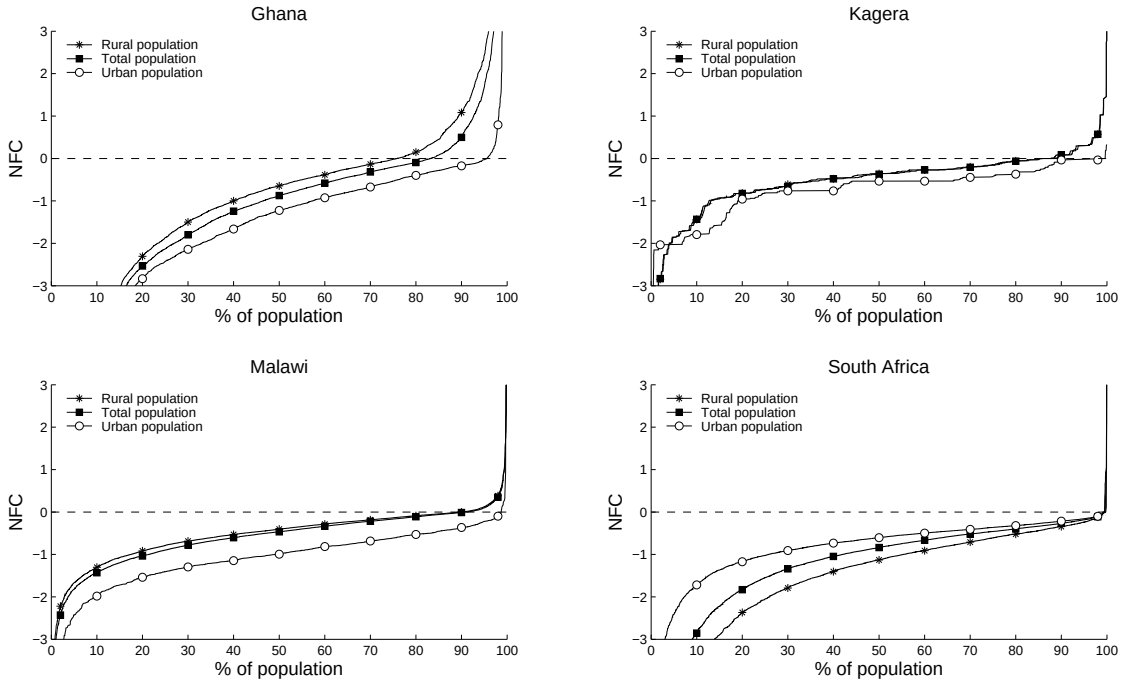

Figure 4: Non-Food Compensation (NFC) ratio, measuring the relative reduction in non-food spending needed to uphold food consumption at the same level after a food-price change. The shares of net food-buyers and net food-sellers are the same as in NBR, but the absolute values are larger for this indicator, due to the ”high price” in non-food consumption these people would have to pay in order to maintain their initial food baskets during price hikes.

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